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UNICORE

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# Reliability, load-balancing, monitoring and all that: deployment aspects of UNICORE

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UNICORE Summit 2016
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# Outline

- Clustering – recent progress
- Monitoring using RESTful APIs
- Ideas for improving and simplifying deployment
- Outlook

UNICORE

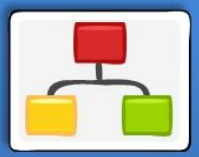

Web


Command line


GUI

API

## Clients


Workflows


Jobs


Data Management


Discovery

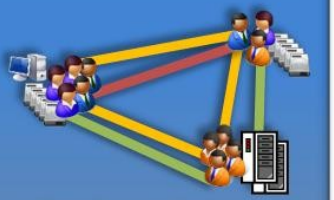
## Services


Compute


Storage

## Resources


Users


Federations


Policies

## Security

# Clustering

# Clustering - motivation

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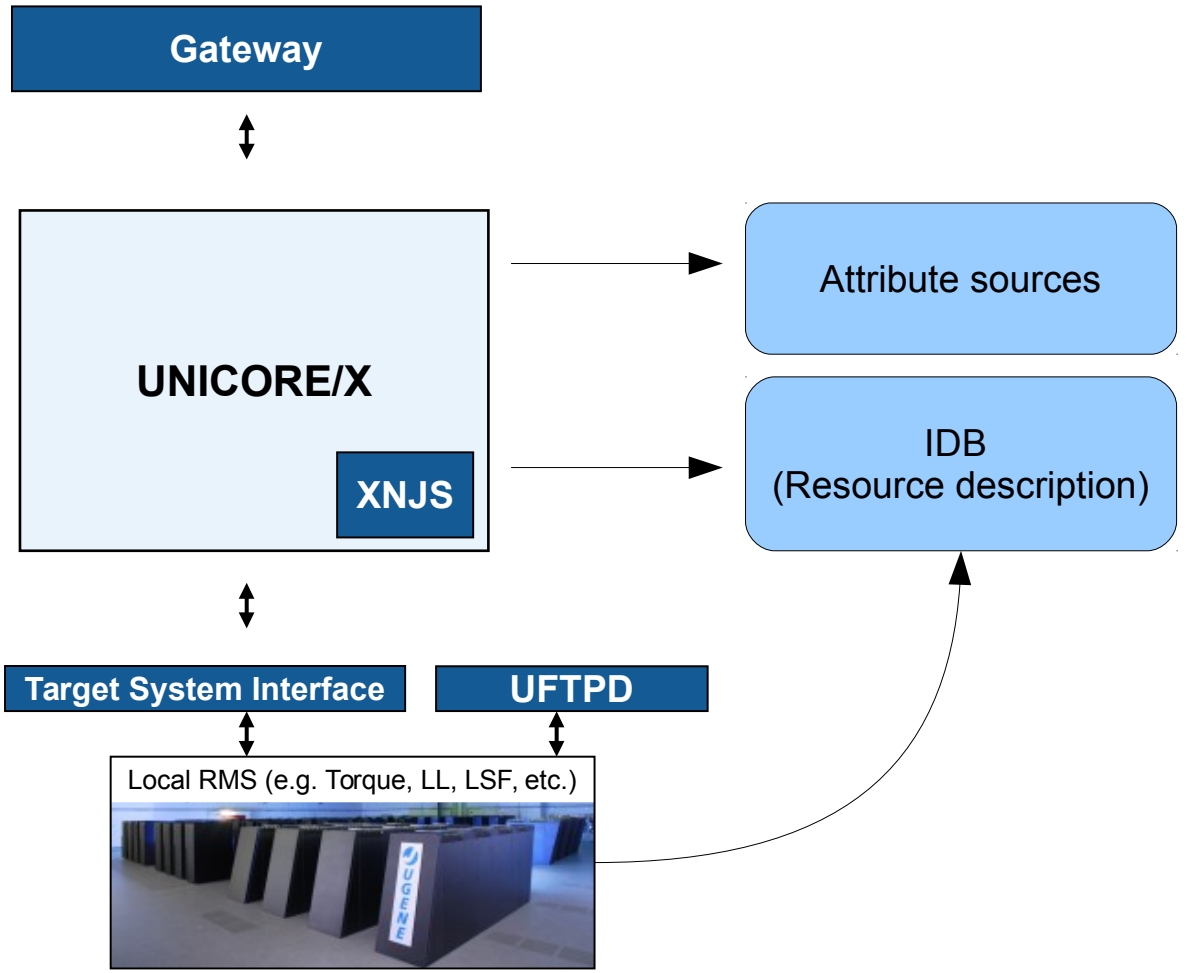
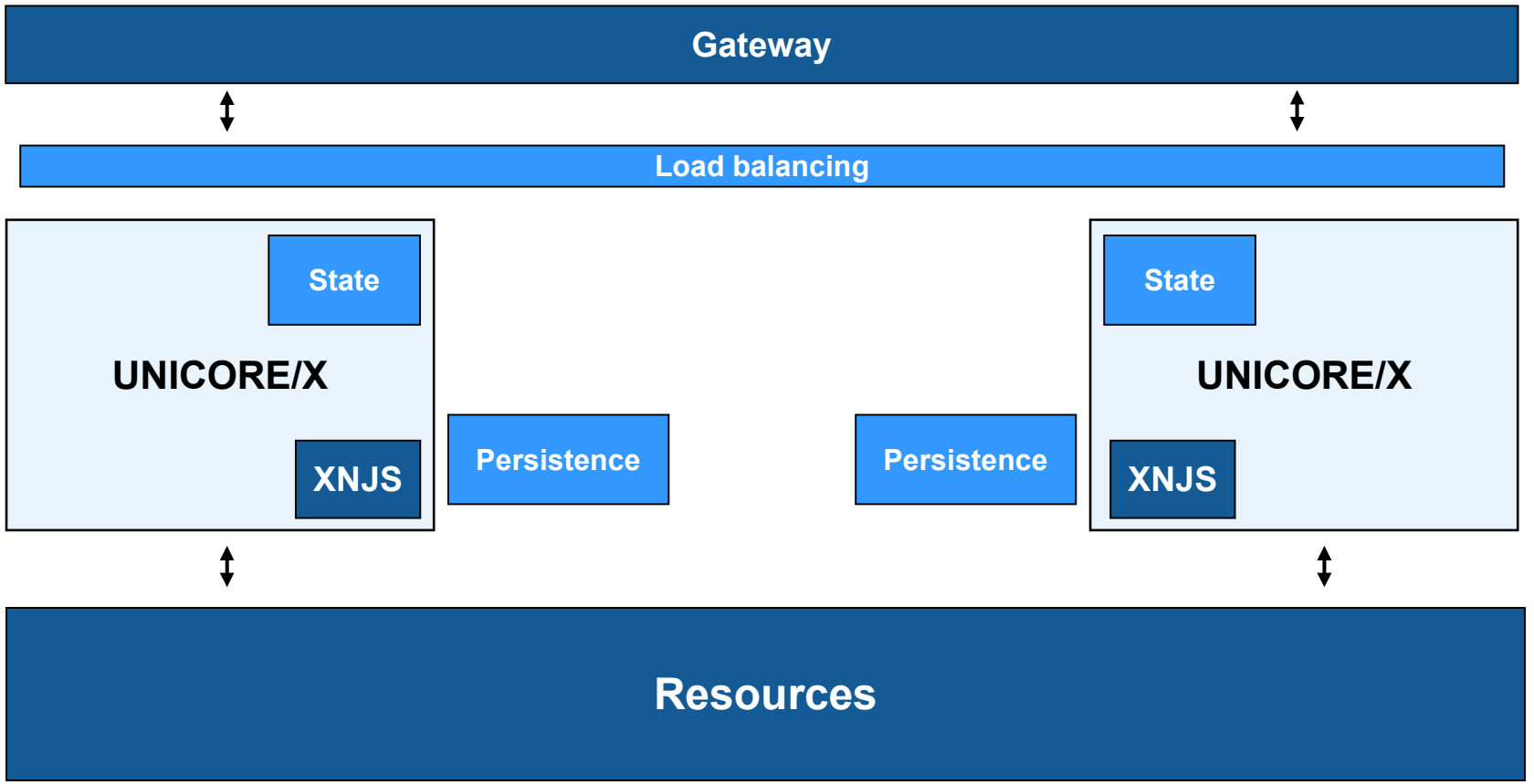
- Different types of clustering
- Fallback (master with a slave as backup)
  - Higher level of availability (software updates, crashes...)
  - Already available (with some data loss when switching)
  - Can be realised „externally“ (e.g. using DNS)
- Round-robin **Goal of this work!**
  - Cluster members are fully equivalent
  - All cluster members have something to do
  - Can deal with higher load than single server
  - Ideally no loss of data when cluster member crashes

# Basic UNICORE



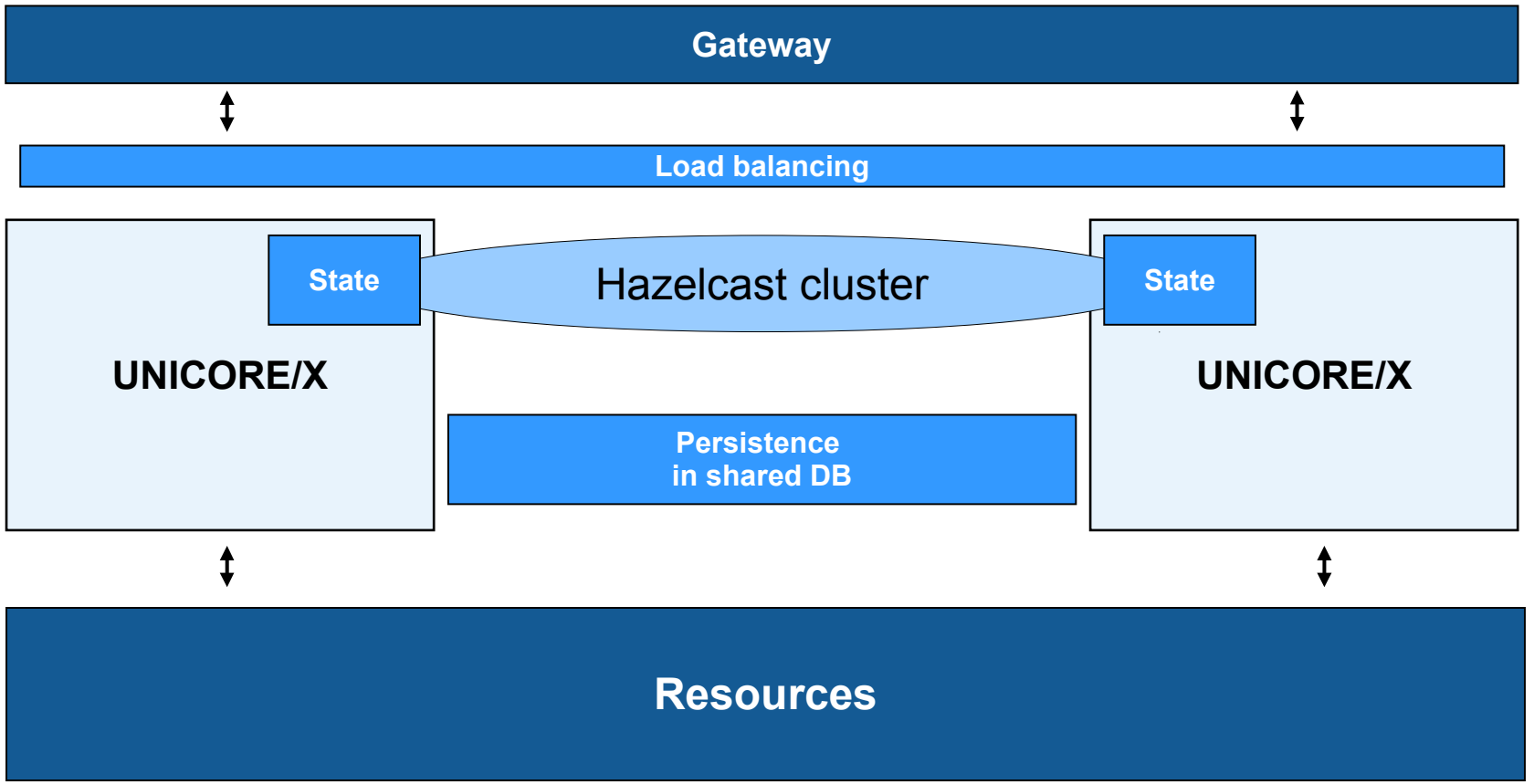
# Clustering – goal



# Clustering – areas of work

- Persistence
  - Stores resources
  - Can be shared between UNICORE/X servers (e.g. MySQL DB)
- State in UNICORE/X
  - Running file transfer threads
  - Security sessions
  - Internal management information (e.g. number of resources per user)
  - Work queue in the XNJS (jobs currently being processed)
  - …?

# Clustering – implementation



# Load balancing

- Gateway has a built-in load balancer
  - Define a site as „multi-site“
  - Both fallback and round-robin
- Other options like *nginx* should work too

# Clustering – status

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- Update of clustering code using Hazelcast (← awesome!)
  - XNJS work queue
  - File transfers
- Reorganisation of internal management data

- TODO
  - Security sessions
  - BFT file transfers

# Example: profile CPU usage
# 2 node cluster, primary/fallback, run 100 jobs

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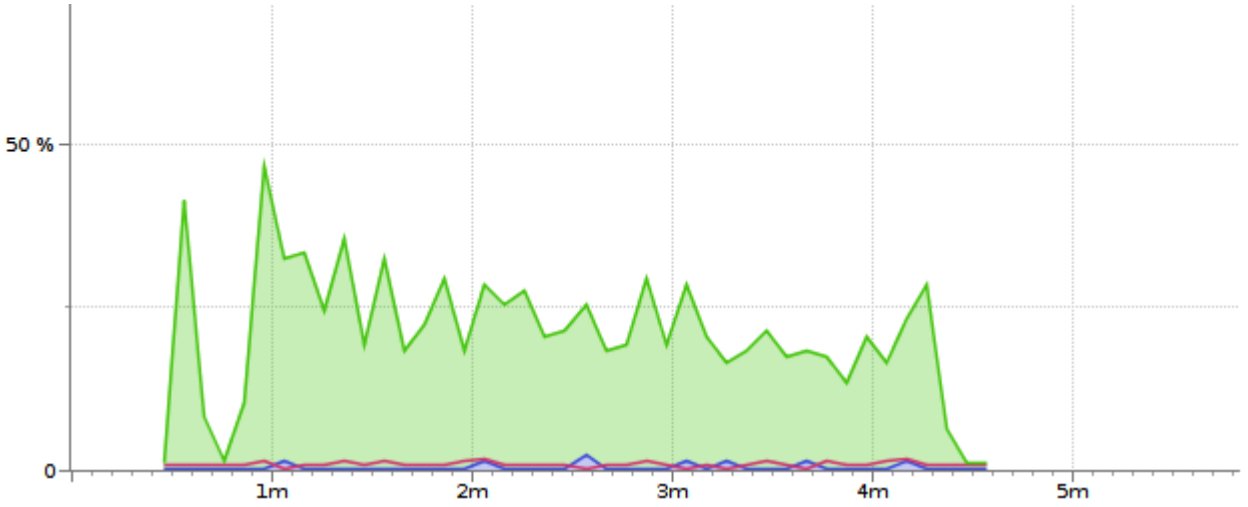
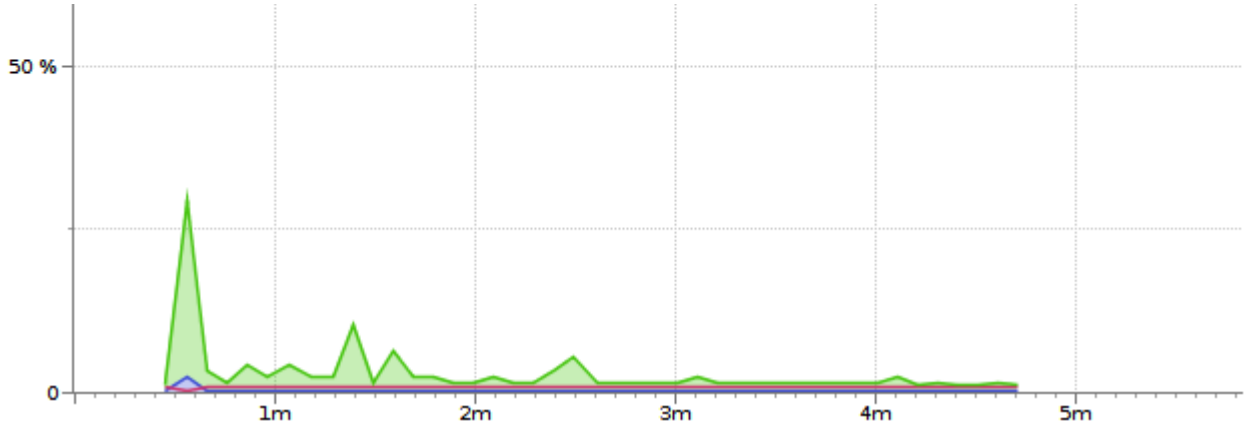
## Primary




## Fallback



# Example: profile CPU usage
# 2 node cluster, round-robin, run 100 jobs

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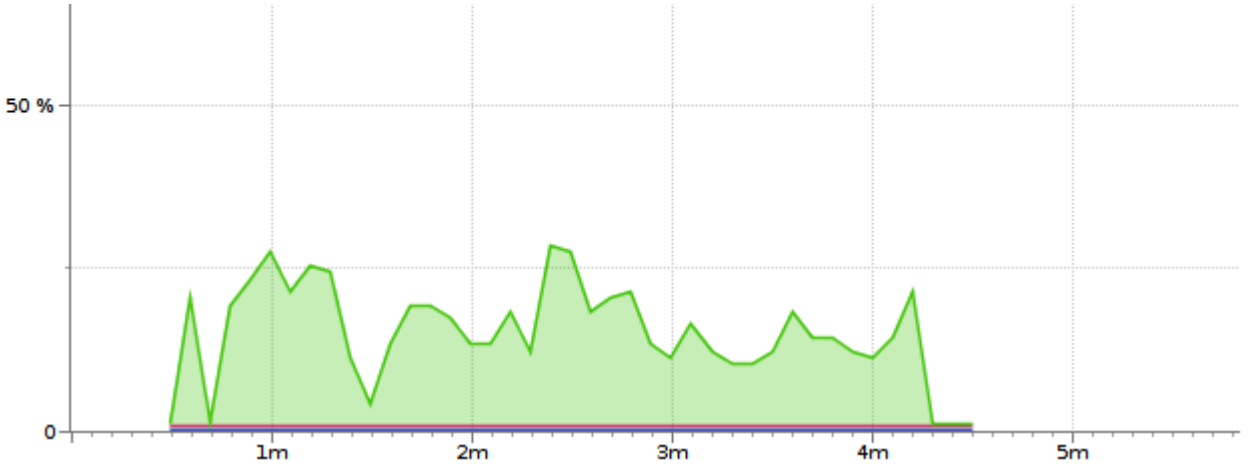
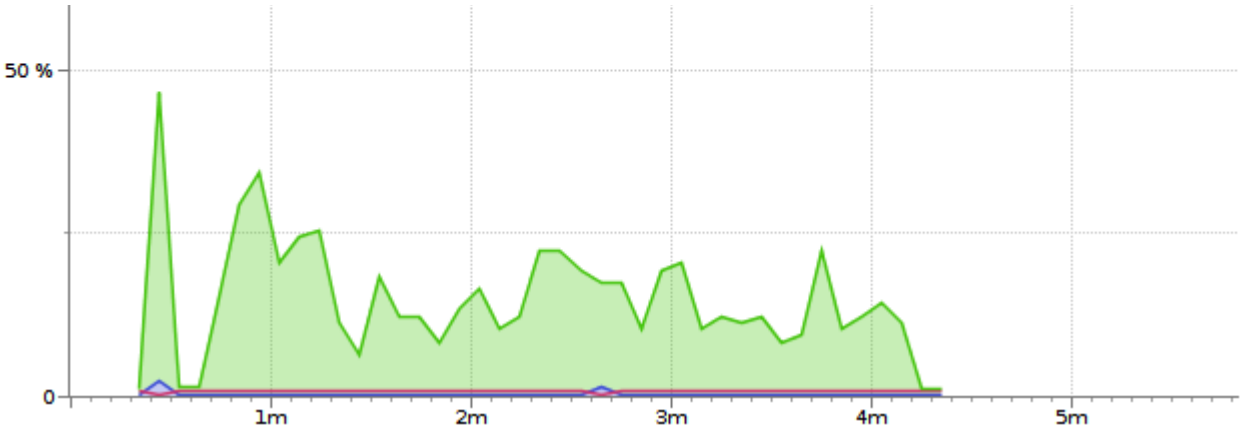
## Node A




## Node B



# Clustering – how to deploy

- UNICORE/X nodes must access the same resource(s)
  - Shared database
    - *H2 in server mode*
    - *MySQL (recommended)*
- Hazelcast config
  - IP address and port for cluster
- Identical config for UNICORE/X nodes
  - Services, options, etc
  - Same certificate

# Monitoring

# Monitoring – status

- Monitoring framework developed in EMI
  - Nagios/Icinga plugins
- Advantages
  - Very detaileded checking (applications, storages, etc)
- Disadvantages
  - Relatively complex
  - Dependency on UCC and its (unstable) output

# Alternative: monitoring using RESTful APIs

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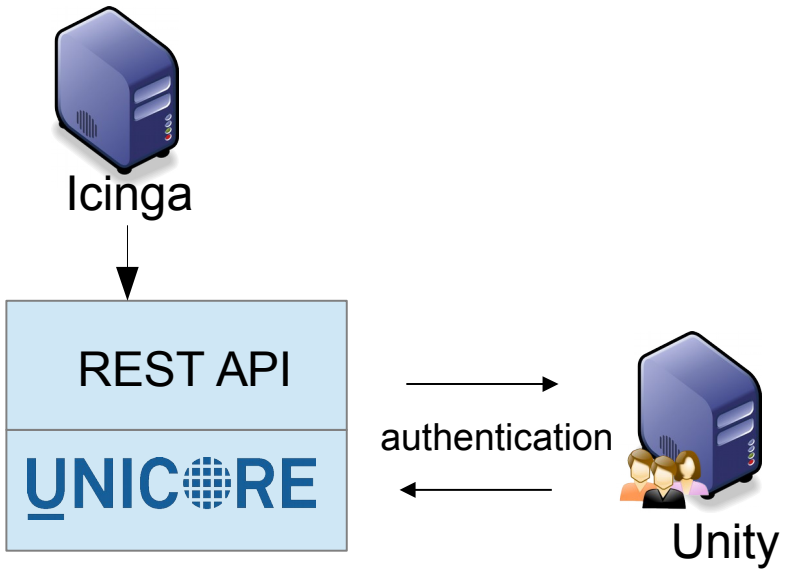
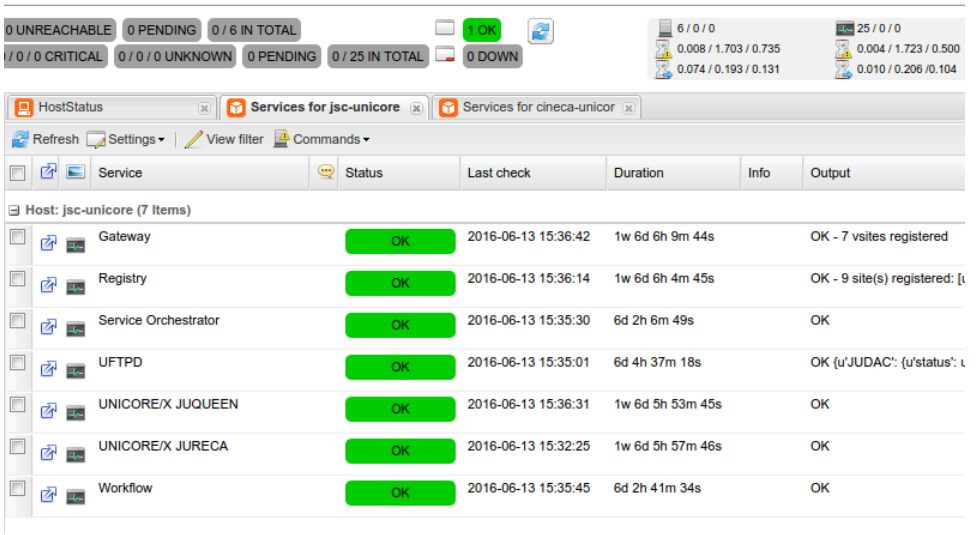
- RESTful APIs cover most of UNICORE's functionality
  - Jobs, data, workflow submission and status checks
  - UFTP authentication server
- Advantages for monitoring
  - Very simple, can be implemented using Python or any other tool that can deal with HTTPS and JSON
  - Username/password authentication

# Monitoring the Human Brain Project's HPC platform

- Monitoring user configured at each site (Unity, XUUDBs)
- Gateway, UNICORE/X, Workflow, Service Orchestrator, Registry, UFTPD (via Auth server)




# Outlook – some ideas for deployment

# Setup/deployment issues

- High complexity
  - Different services on different physical servers, requiring matching entries in config files
  - Manual adaptation to local BSS (queues, nodes, …)
  - Non-intuitive format of config files (IDB, xnjs.xml, wsrflite.xml)
  - No config editor
- X.509 server certificates required for production deployments
- UNICORE/X is very large, no module system for deployment

# Potential improvements ...

- „Zero-conf“: commandline based tools to simplify setup and configuration
  - Centralised config service e.g. on the gateway
  - CA for the internal services
  - Use host certificates
  - Make trusted CA certs available centrally
  - Auto-accept (or ask admin to confirm) trusted CA on first connect
- Simpler or re-organised config files? (e.g. XNJS config files)
- Lightweight deployment as docker images
- Self-testing features for the TSI

# Thank you!